

Urbanization, Water Quality, and Local Watershed Management: An Integrated Approach

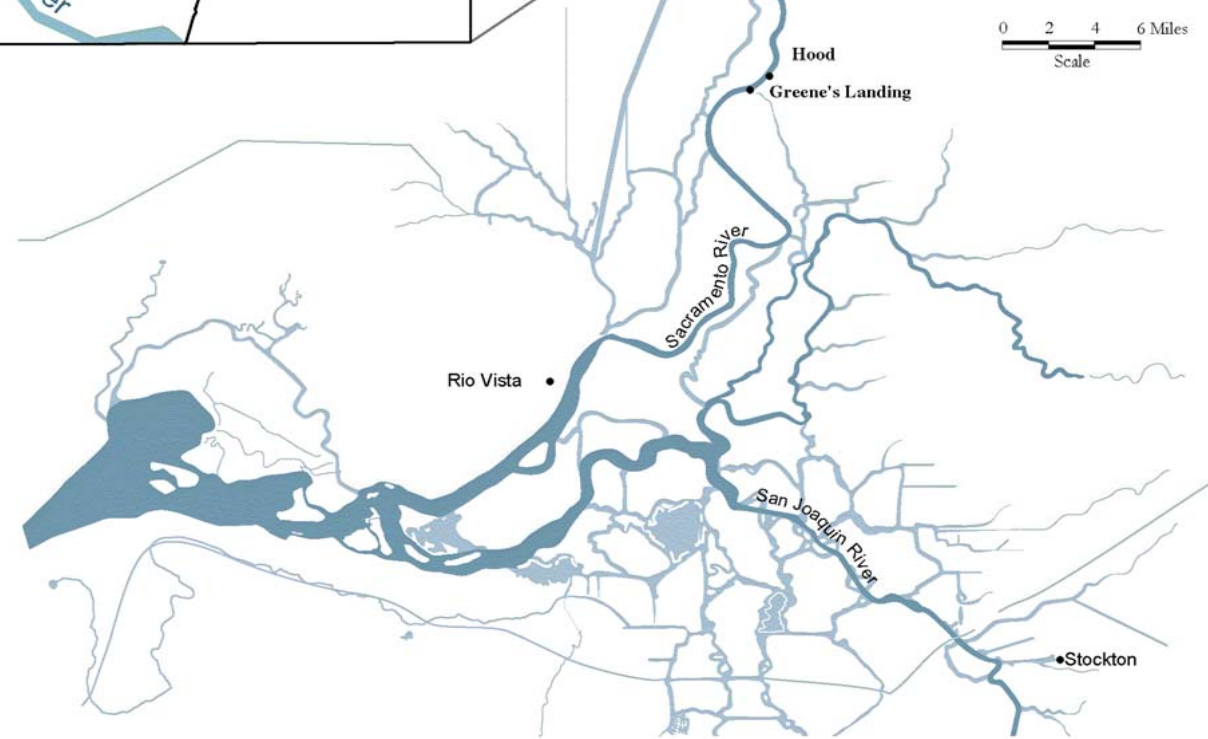
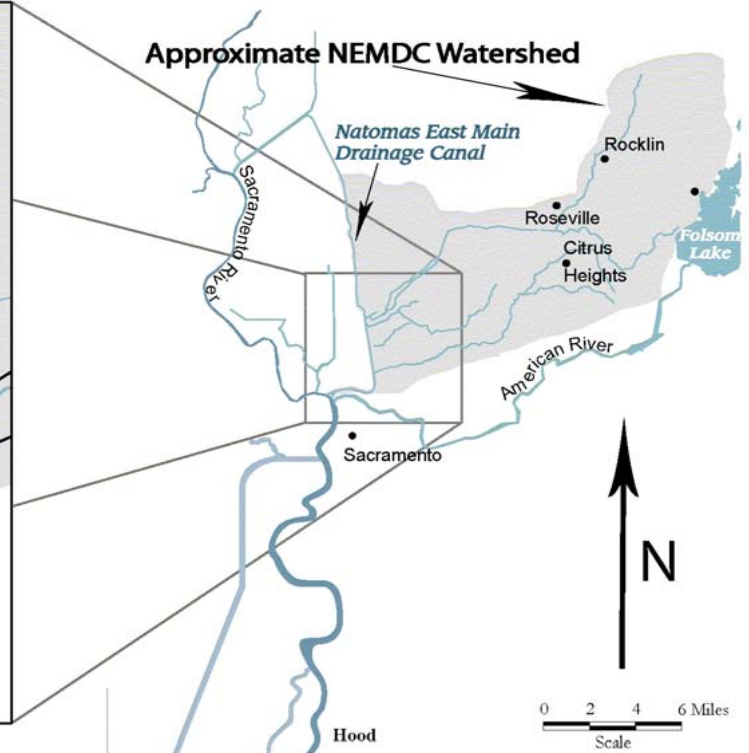
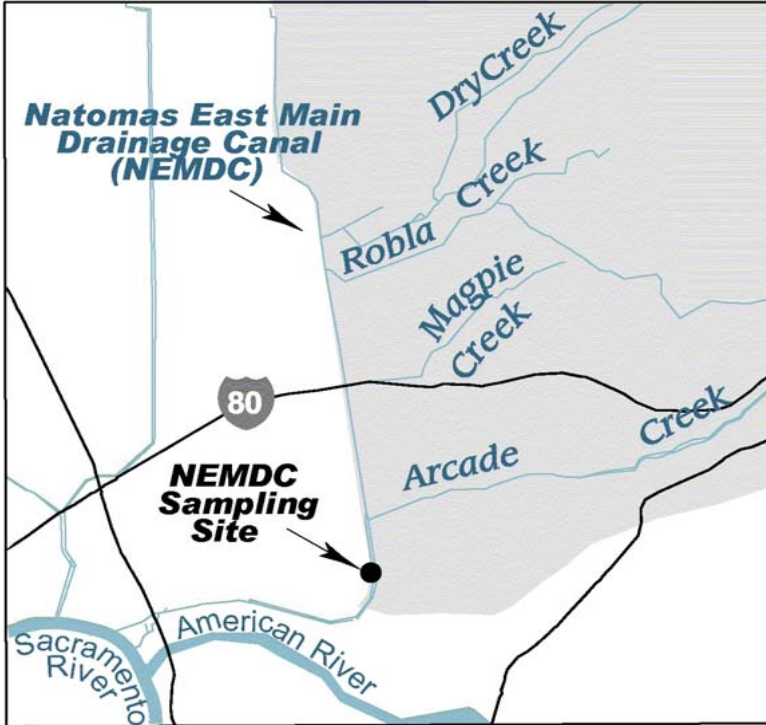
Steelhead Creek, Sacramento Co., CA

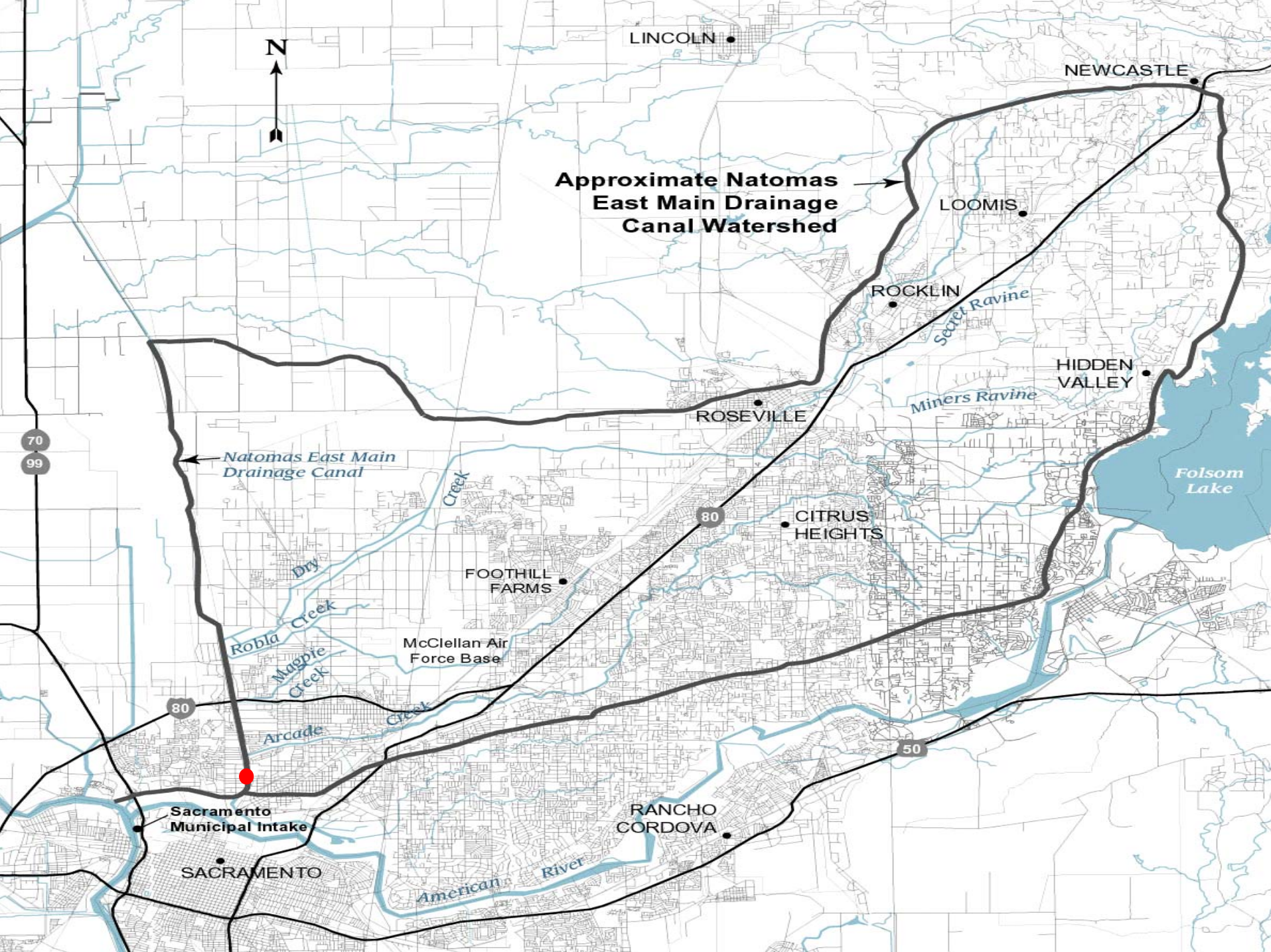


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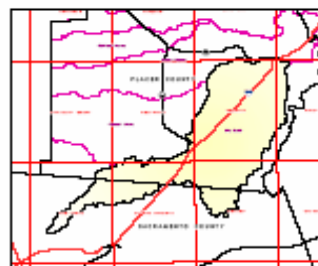
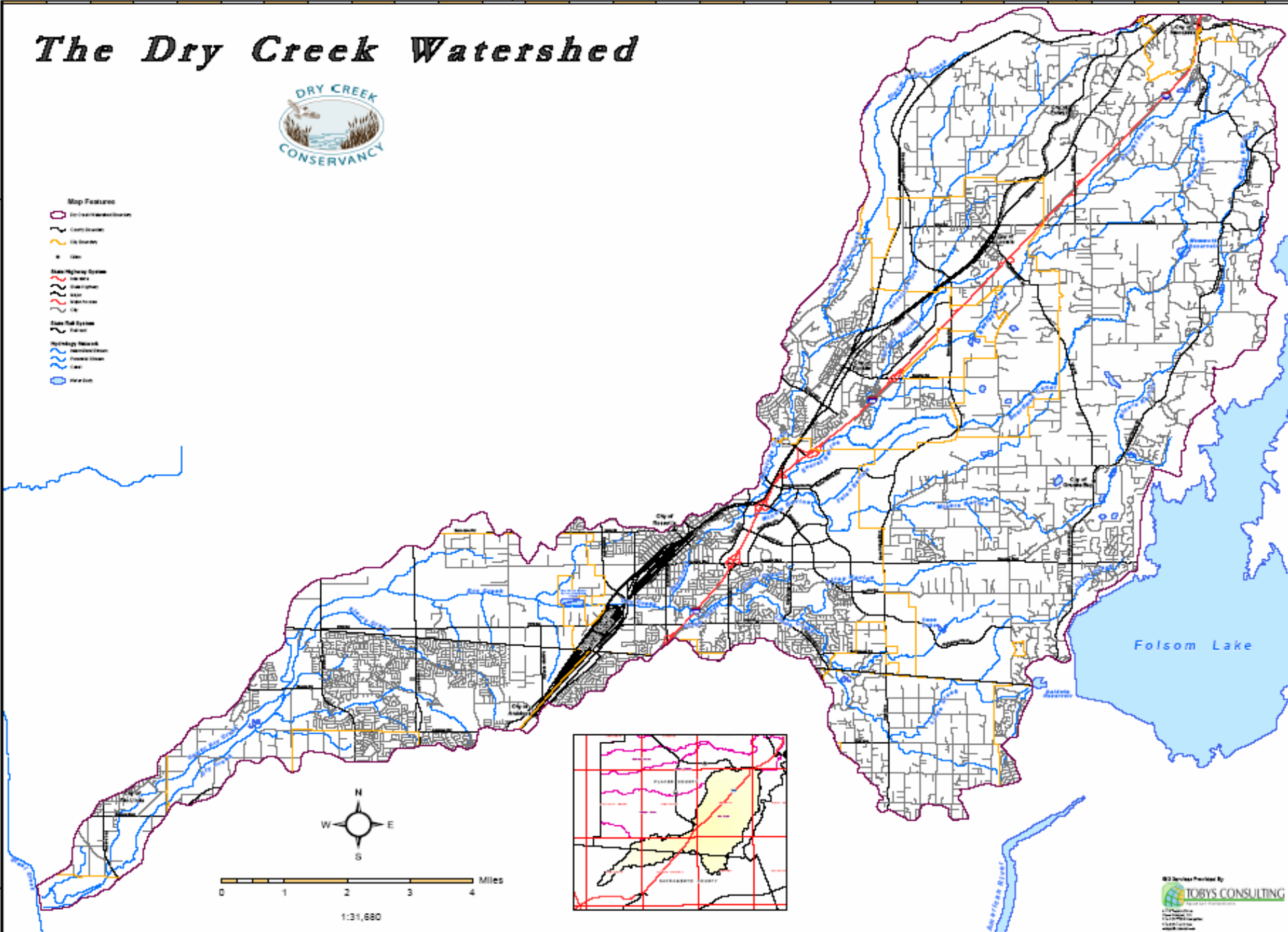


The Dry Creek Watershed



Map Features

- Dry Creek Watershed Boundary
- County Boundary
- City Boundary
- City
- State Highway System**
 - Interstate
 - State Highway
 - Water Feature
 - City
- State Rail System**
 - Railroad
- Hydrology Network**
 - Watershed Stream
 - Canal
 - Irrigation



0 1 2 3 4 Miles

1:31,680

Grant Project Scope

- CalFed/SWRCB Prop 13 grant (began summer 2004) for \$600,000
- Dry Creek Conservancy (DCC) is project lead; DWR/DES is a subcontractor
- Three major tasks
 - Water quality monitoring and assessment
 - Hydrologic monitoring and assessment
 - Upper watershed monitoring and assessment
- Water quality has two separate but related studies.

Major Watershed Urbanization Issues

- Loss of riparian habitat
- Stream channelization
- Hydromodification
- Reduced floodplain

Contributes to:

- **Water quality problems:**
higher turbidities, TSS
temperatures,
nutrients, and bacteria.
- **Bank erosion,**
- **Increased sediment transport,**
- **Degraded habitat.**









Watershed Monitoring - Preliminary Results

Main concerns:

- Increased sediment, turbidity peaks, high fecal coliform counts associated with storm run-off
- Bank stability, vegetation, and riparian vegetation width indicates low habitat quality - trend toward future erosion issues
- Total organic carbon all sites = 2.5 - 14.3 mg/L

Other:

- Majority of pesticides and anthropogenic compounds below analytical detection limits

Excessive Sediment - Findings by DCC Staff and Volunteers

- During the last several years excessive sediment entered Dry Creek tributaries from residential construction sites, bank erosion, illegal dumping, and OHV's
- Highest levels found October to February = potential threats to Salmon and Steelhead populations
- Sediment important since some biological studies quantitatively link sediment/TSS to egg and juvenile fish mortality



**Wet/dry weather
urban runoff can yield
high sediments**

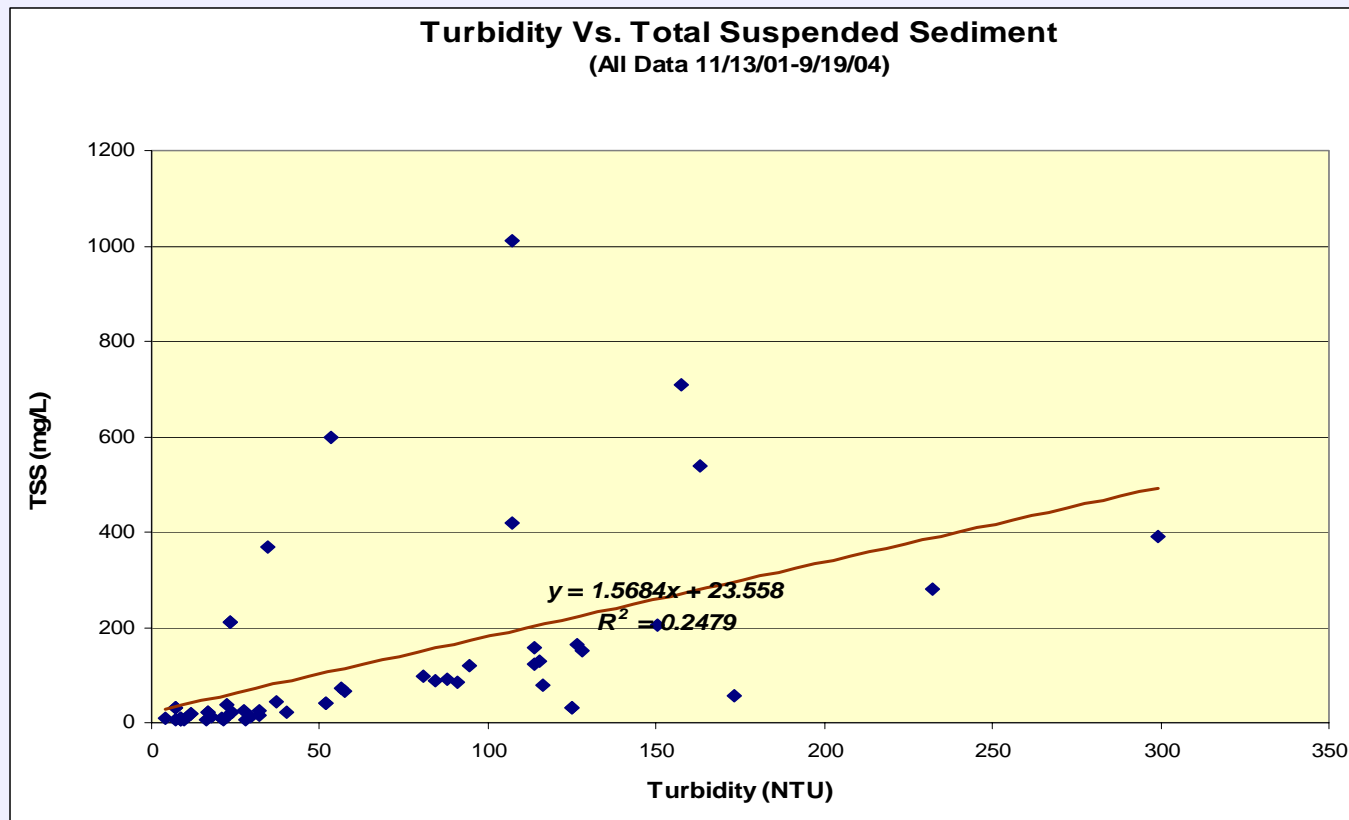
Clover Valley Creek



Sucker Ravine Creek

Turbidity-TSS Sediment Relationship

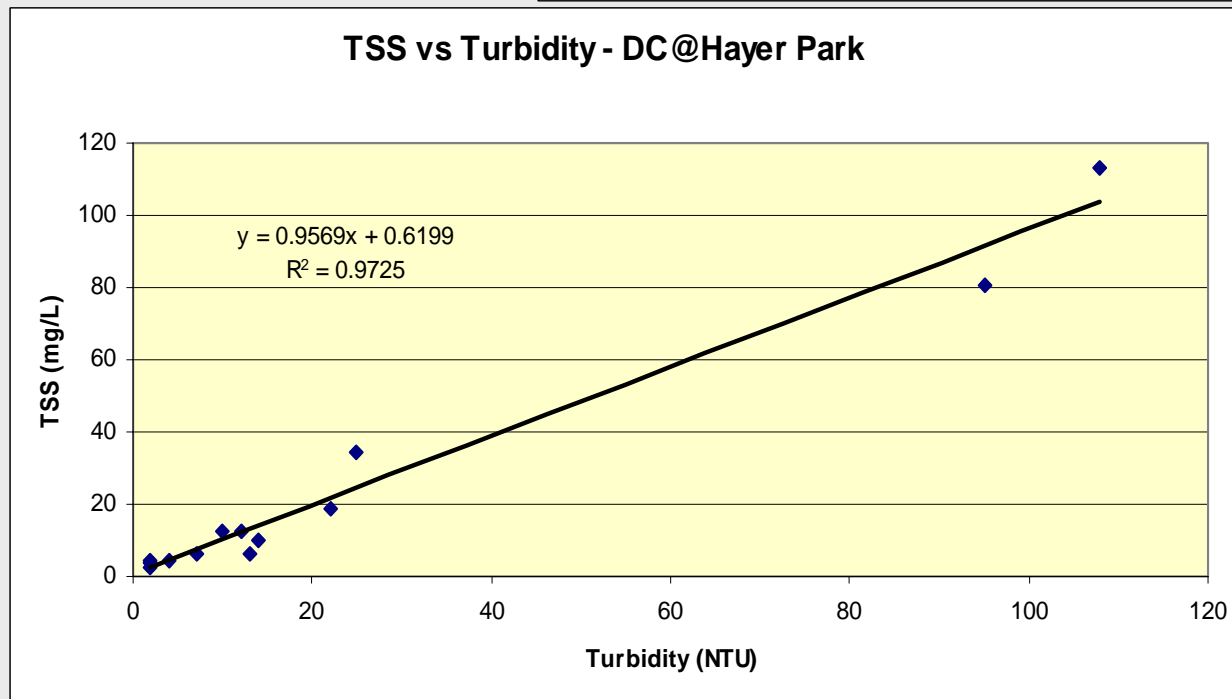
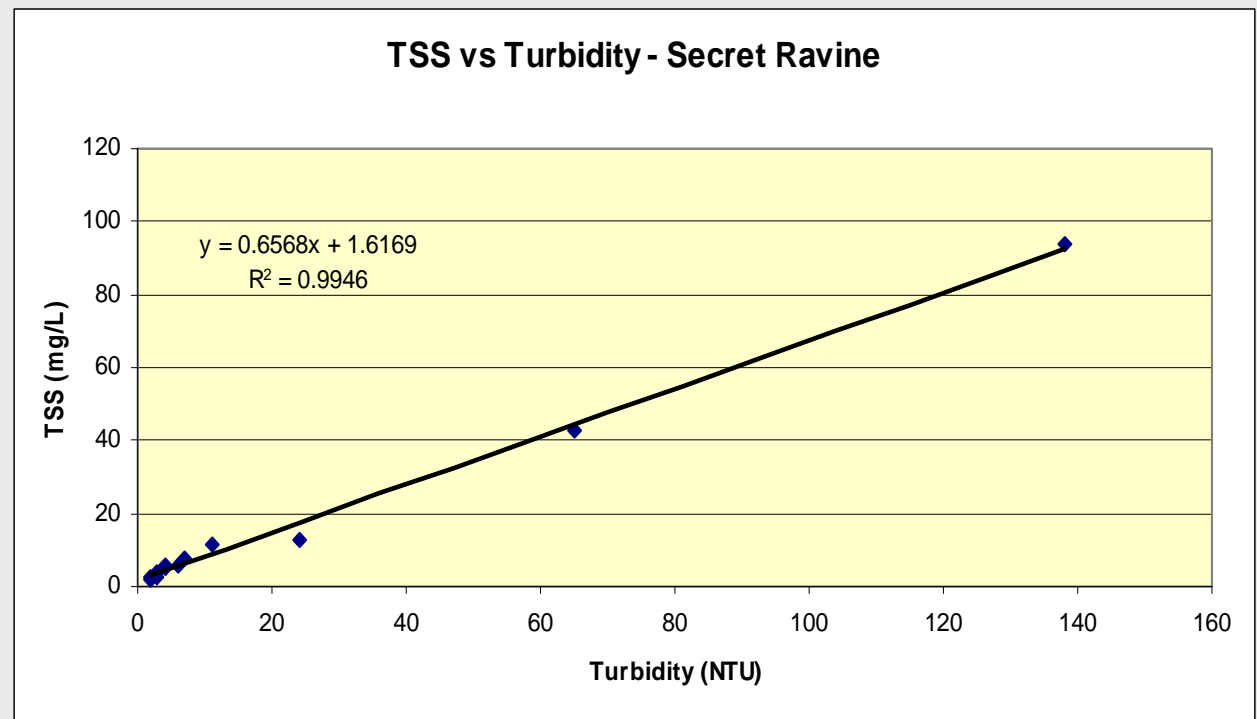
- Turbidity-TSS change dramatically with different rain events and other conditions
- Goal is to use Turbidity-TSS correlations to apply to continuous instream logger data to better quantify sediment loads
- Lab analysis for TSS more costly, so samples often not collected by non-profit organizations



Preliminary Results

Dec 04- Aug 05

Upper Watershed Site



Lower Watershed Site

The Drinking Water Quality Concern

Natural Organic Matter (i.e. Organic Carbon) + Disinfectant (e.g., chlorine) =====> Disinfection By-Products (DBPs)

DBPs are potential carcinogens

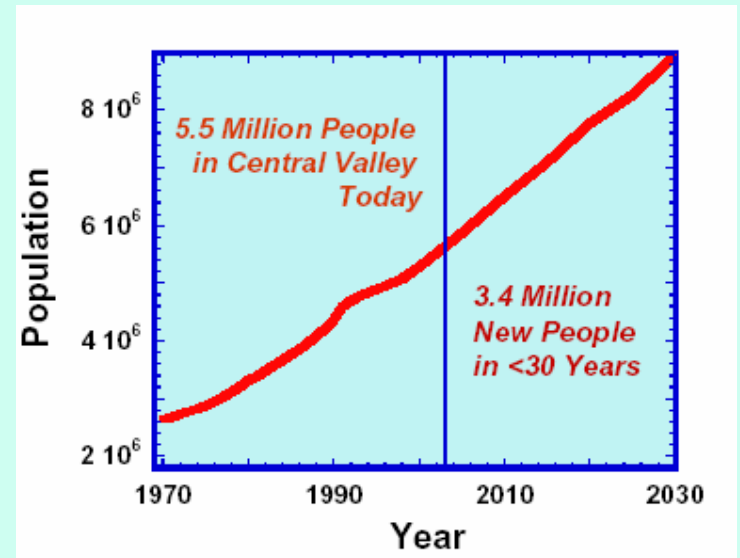
DBPs regulated by EPA Disinfectants/Disinfection By-Products Rule

which means

- Lower limits on levels of DBPs in drinking water
- Must reduce total organic carbon (TOC) prior to treatment if raw water > 2 mg/L

What Do We Know About Urban OC Sources?

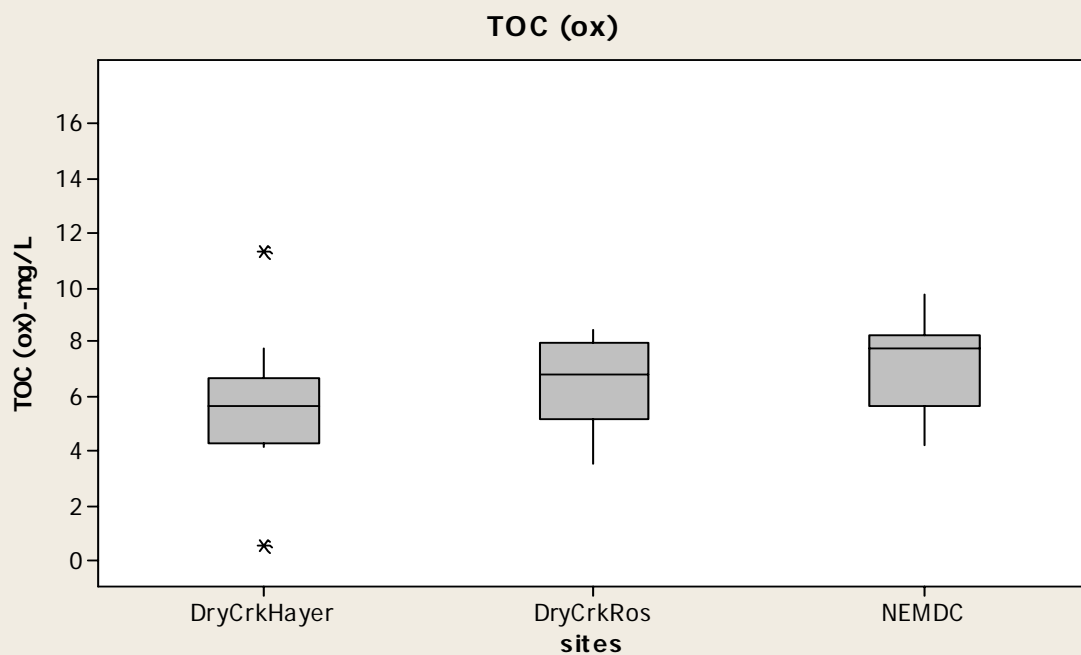
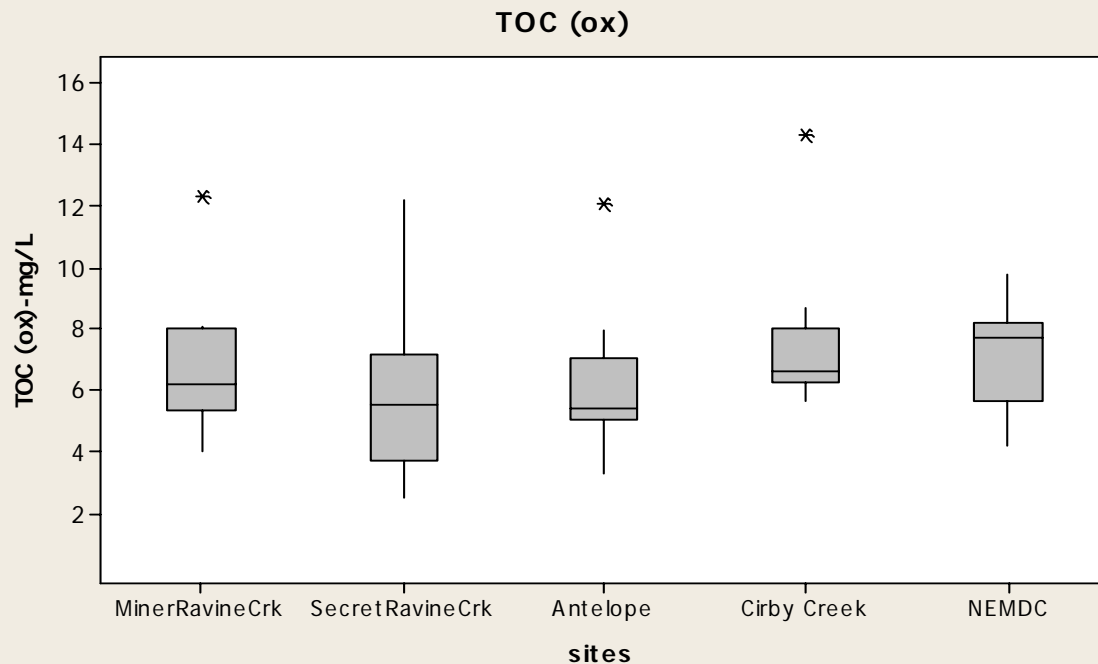
- Increasing Delta-wide due to high growth rates
- Difficult to monitor and evaluate impacts (NPS effect)
- Potential impacts depend on hydrology, time, and proximity to intakes (as with other sources)
- Contribution from urban, other land uses not well understood



Total Organic Carbon

Dec 2004 - Aug 2005

**Upper Watershed Tributary
Sites + NEMDC**



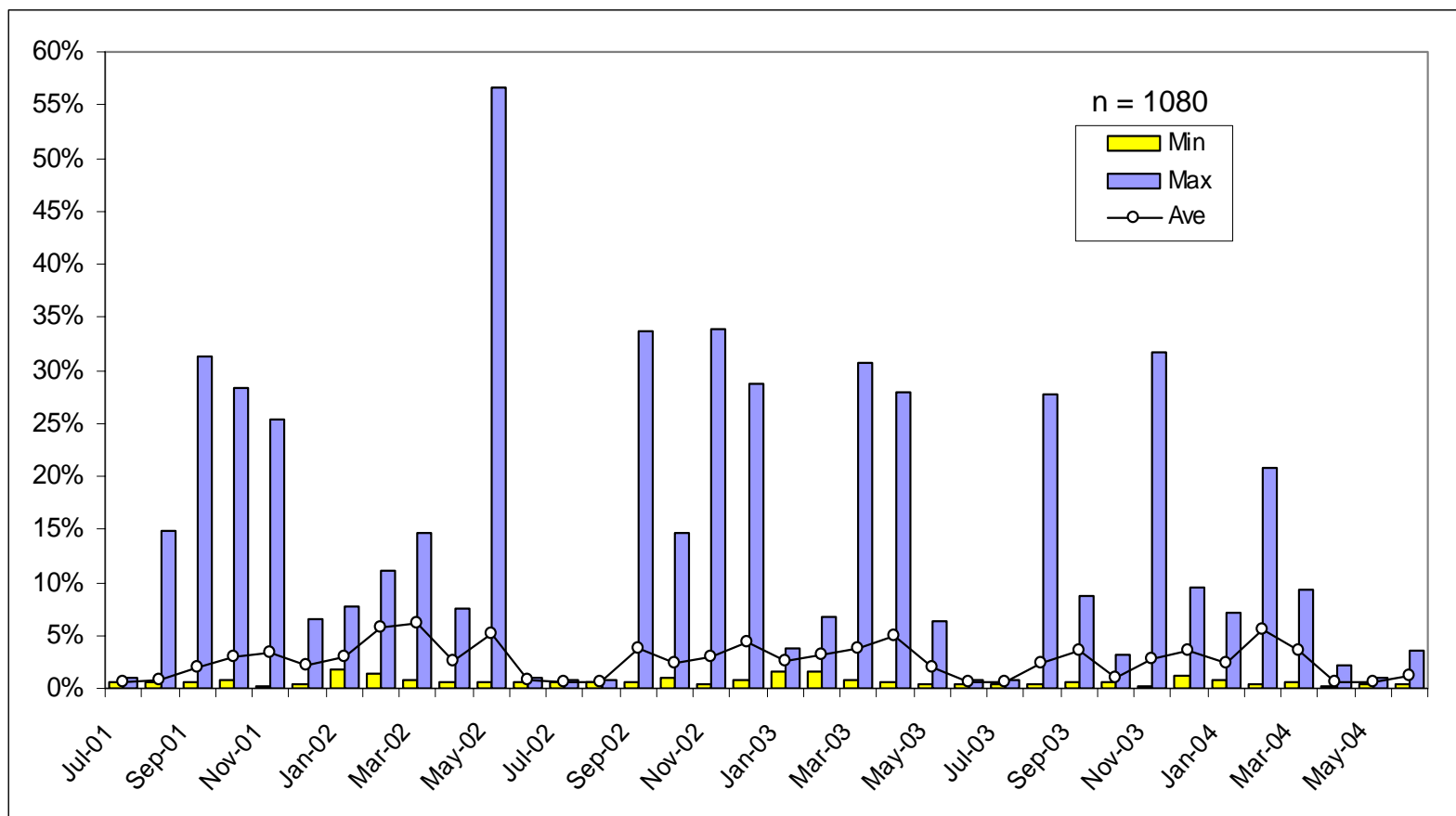
**Lower Watershed Sites -
Dry Creek + NEMDC**

Daily NEMDC Contribution to Total Sacramento River TOC Load

July 2001 - June 2004

Number of Days TOC Load Contributions to the Sacramento River were at or above 5%, 10%, and 20%

	Load Contribution		
	5%	10%	20%
NEMDC	124	36	17



Conclusions

- Increased turbidity, excessive sediment associated with urban activities in upper watershed areas
- Areas of streambank erosion, low habitat quality observed
- NEMDC urban runoff can be a significant TOC loading source to Sacramento River during storm events
- Relationship between TOC and land use not well understood; more data needed for robust analysis

Specific Dry Creek CRMP Recommendations - Water Quality

- Do long-term flow and water quality monitoring
- More data loggers at more sites (flow, turbidity)
- Sediment monitoring (pyrethroids, sediment characteristics)
- Focus efforts on reducing monitoring for non-detect constituents and shift funds toward other monitoring needs
- Expand monitoring at sites/season already indicating poor habitat and changes in benthic community
- Education - support LID by city, county, private
- **Implement Specific Projects**

Completed and Future Projects

- Dry Creek Restoration Project
- Secret Ravine Floodplain Restoration
- Secret Ravine Habitat Restoration
- NPDES Phase II Stormwater MP's
- Cirby Creek Confluence Pipeline Improvement
- Dry Creek Flood Control and Environmental Enhancement

More info: <http://drycreekconservancy.org/>